

Activity #17

LIQUID DENSITY AND TEMPERATURE

KEY CONCEPT

Water at temperatures above 4°C (about 39°F) decreases in density with increases in temperature.

SKILLS

Observing, predicting, comparing, experimenting

TIME

15 minutes

AUDIENCE

Students, grades 6-8

SAFETY

Do not use water that is hot enough to cause burns.

CONTENT FOCUS

Hot water will rise up through cold water but cold water will not rise in hot water.

TIPS

- 2-liter plastic beverage containers with the rounded top removed work well for the large containers.
- A little of the colored cold water may escape while the bottle is lowered into the hot water. If you wish to avoid this, cover the colored cold water with a cap, cork, or stopper, lower into the container of hot water with tongs and hold in place. Then use a second pair of tongs to remove the cap, cork, or stopper.
- Water vapor may condense on the outside of the large container when it is full of cold water. Just wipe it off. (Explaining why the water vapor condenses can be another science lesson.)
- An ice chest or thermos can be used to store either the hot or cold water.
- Tongs should be used to avoid putting hands into either very hot or very cold water.

ADVANCE PREPARATION

Add ice cubes to cold tap water to make it colder.

MATERIALS (for each group of 2)

- 2 large clear wide-mouth containers
- 2 small bottles with small mouths and narrow necks
- very cold water
- hot water
- food coloring
- kitchen or laboratory tongs

PROCEDURE

1. Fill 2 large clear containers with water – one hot and one cold – until they are both about $\frac{3}{4}$ full
2. Add 5 drops of food coloring to each of 2 small bottles.
3. Fill one of the small bottles with hot water and the other with cold water.
4. Use the tongs to grasp the top of the small bottle filled with hot water and carefully lower it into the large container of cold water.
5. Slowly remove the tongs and observe.
6. Then use the tongs to grasp the top of the small bottle filled with cold water and carefully lower it into the large container of hot water.
7. Slowly remove the tongs and observe.

DISPOSAL

Liquids may be rinsed down the drain.

EXTENSIONS

Make colored ice cubes by mixing food coloring with water before pouring the solution into an ice cube tray and freezing. Fill a clear plastic cup with hot tap water, add a colored ice cube, and observe. Streamers of colored water from the melting ice cube should move to the bottom of the glass. You may instead place a few drops of food coloring on top of an ice cube floating in a cup of water. You will notice a similar result.

SUGGESTED QUESTIONS

1. Describe what you observed when the small bottle of colored hot water was lowered into the large container of cold water.
A stream of hot colored water rose out of the small bottle and flowed to the top of the ice water in the large container.
2. Describe what you observed when the small bottle of colored cold water was lowered into the large container of hot water.
Other than a little colored cold water escaping during the lowering process, the cold water remains in the small bottle.
3. Which is more dense, the **hot** water or the **cold** water? How do you know?
The hot water rose to float on the cold water but the cold water did not rise to float on the hot water. Less dense liquids float on more dense liquids so the cold water is more dense.

REFERENCE

Sarquis, Mickey and Sarquis, Jerry Chemistry Is Fun: A Guide for Chemistry Activities at All Grade Levels; The Institute for Chemical Education, University of Wisconsin, Madison, WI, 53706; Volume 1, 1990.